

REMARKS

The application has been reviewed in light of the final Office Action dated February 25, 2008. Claims 1 and 11-13 were pending, with claims 2-10 having previously been canceled, without prejudice or disclaimer. By this Amendment, unexamined, non-elected claim 13 has been canceled, without prejudice or disclaimer, claims 1, 11 and 12 have been amended to clarify the subject matter claimed thereby, and new claim 14 has been added. Accordingly, claims 1, 11, 12, and 14 are now pending and presented for continued examination, with claims 1, 11 and 12 being in independent form.

Claims 1, 11 and 12 were rejected under 35 U.S.C. §103(a) as purportedly unpatentable over Seto (US 2001/0055051 A1) in view of Takeuchi (U.S. Patent No. 6,351,056).

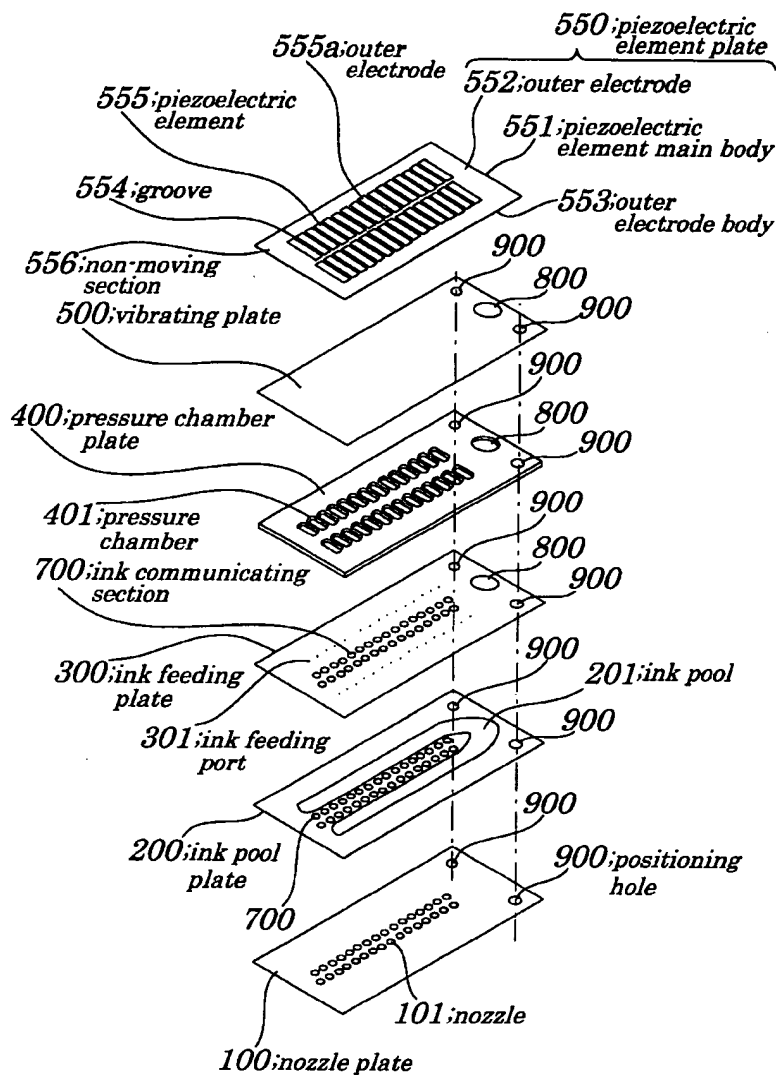
Applicant has carefully considered the Examiner's comments and the cited art, and respectfully submits that independent claims 1, 11 and 12 are patentable over the cited art, for at least the following reasons.

The present application relates to improvements devised by applicant to a liquid discharge head including a nozzle configured to discharge a liquid drop by using a piezoelectric element. The piezoelectric element is a stacked layer type piezoelectric element wherein a plurality of piezoelectric layers and a plurality of inside electrode layers are reciprocally stacked.

It is desirable to form the electrodes between the piezoelectric elements with high adhesion and form the electrodes between the piezoelectric elements with economical material. Accordingly, the material to be used is limited, and metal having a high melting point is not used in the piezoelectric layer but rather the piezoelectric material has a sintering temperature less than 1200 °C.

Seto, as understood by applicant, proposes an ink jet type printer head of a different structure, as shown in Seto, Fig. 1 (reproduced below).

FIG. 1



As can be seen in Fig. 1 of Seto, each piezoelectric element 555 consists of piezoelectric material sandwiched between an outer electrodes 555a and outer electrode body 553.

The piezoelectric element in the ink jet type printer head proposed by Seto is NOT, however, a stacked layer type piezoelectric element wherein a plurality of piezoelectric layers and a plurality of inside electrode layers are reciprocally stacked.

Further, it is acknowledged in the final Office Action that Seto does not disclose or suggest a piezoelectric layer formed by a piezoelectric material not including lead but having bismuth sodium titanate, as main ingredients, the piezoelectric material having a sintering temperature less than 1200 °C.

Takeuchi, as understood by applicant, proposes a piezoelectric device for use in an optical system to adjust an optical path length. Takeuchi proposes specific piezoelectric materials for use individually or as a mixture, such as lead zirconate, lead titanate, lead magnesium niobate, lead nickel niobate, lead zinc niobate, lead manganese niobate, lead antimony stannate, lead manganese tungstate, lead cobalt niobate, barium titanate, sodium bismuth titanate, potassium sodium niobate, strontium bismuth tantalite. In addition, Takeuchi proposes that a piezoelectric element can be formed by sintering a ceramic green laminated body at a temperature of 1200 to 1600 degrees Celsius.

Takeuchi, like Seto, does not disclose or suggest, however, a liquid drop discharge head including a nozzle configured to discharge a liquid drop by using a piezoelectric element, the piezoelectric element being a stacked layer type piezoelectric element wherein a plurality of piezoelectric layers and a plurality of inside electrode layers are reciprocally stacked.

Further, it is noted that when the piezoelectric element is, like in Seto, not the above-mentioned stacked layer type piezoelectric element wherein a plurality of piezoelectric layers and a plurality of inside electrode layers are reciprocally stacked, there is not a motivation for decreasing the sintering temperature (that is, incorporate, into a liquid drop discharge head, a ceramic mainly comprised of bismuth sodium titanate that is sintered at a temperature of less than 1200 degrees Celsius).

Generally, a sintering temperature of a lead-free piezoelectric element is high (above

1200 degrees Celsius).

Therefore, since Seto does not involve a stacked layer type piezoelectric element wherein a plurality of piezoelectric layers and a plurality of inside electrode layers are reciprocally stacked, one of ordinary skill in the art would not have been motivated to incorporate, into the liquid drop discharge head of Seto, a ceramic mainly comprised of bismuth sodium titanate that is sintered at a temperature of 1200 degrees Celsius or less.

The cited art, even when considered along with common sense and common knowledge to one skilled in the art, would not render obvious a liquid drop discharge head including a nozzle configured to discharge a liquid drop by using a piezoelectric element, the piezoelectric element being a stacked layer type piezoelectric element wherein a plurality of piezoelectric layers and a plurality of inside electrode layers are reciprocally stacked (independent claims 1, 11 and 12 of the present application).

Accordingly, for at least the above-stated reasons, Applicant respectfully submits that independent claims 1, 11 and 12, and the claims depending therefrom, are patentable over the cited art.

In addition, Takeuchi fails to disclose or suggest that the bismuth sodium titanate in a piezoelectric layer is $((\text{Bi}_{0.5}\text{Na}_{0.5})\text{TiO}_3)$, as provided by the subject matter of claim 16 of the present application.

In view of the remarks hereinabove, Applicant submits that the application is now in condition for allowance, and earnestly solicits the allowance of the application.

If a petition for an extension of time is required to make this response timely, this paper should be considered to be such a petition. The Patent Office is hereby authorized to charge any fees that are required in connection with this amendment and to credit any overpayment to our

Deposit Account No. 03-3125.

If a telephone interview could advance the prosecution of this application, the Examiner is respectfully requested to call the undersigned attorney.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Paul Teng", is written over a horizontal line.

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